



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,887	07/30/2003	Takao Ohnishi	791_204 NP	7943
25191	7590	12/06/2006	EXAMINER	
Burr & Brown PO BOX 7068 SYRACUSE, NY 13261-7068			LIN, JAMES	
			ART UNIT	PAPER NUMBER
			1762	

DATE MAILED: 12/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/630,887

Applicant(s)

OHNISHI ET AL.

Examiner

Jimmy Lin

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 October 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4-7 and 10-12 is/are rejected.
- 7) ☒ Claim(s) 2,3,8 and 9 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Response to Amendment*

1. The substitute specification, amended abstract, and replacement drawings filed 10/5/2006 have been reviewed and will be entered.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 4-5 and 10-11 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrases “applying said coating liquid to *said one or more discrete application portions*” and “different amounts at different ones of a *plurality of said discrete application portions*” (emphasis added by Examiner) are inconsistent. One phrase suggests one or more discrete application portions, while the other phrase suggests two or more. The claim is indefinite as to the amount of discrete application portions required.

Below are suggestions to further clarify the claimed subject matter:

4. Claim 7:

The claim should include that the ends of each piezoelectric/electrostrictive layer extend beyond at least one of the electrodes and that the multilayered structure constitutes at least two piezoelectric/electrostrictive layers and at least three electrode layers, as taught in [0010] of the original and substitute specification.

### *Claim Rejections - 35 USC § 102*

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 1762

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1, 6, 7, and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by Takahashi et al. (2004/0007947, references are made to the provisional application No. 60/395,503).

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

The provisional application No. 60/395,503 has been reviewed.

Takahashi discloses a piezoelectric film device, comprising:

a lower electrode, a piezoelectric layer, and an upper electrode successively formed over a ceramic substrate;

forming the piezoelectric layer so that the ends of the piezoelectric layer project beyond the ends of at least one of the electrodes;

coating a coating liquid prepared by admixing a polymerizable oligomer and inorganic particles in a dispersing medium through a gap between the projecting portion of the piezoelectric layer and the substrate and coat a predetermined portion of said at least one electrode [0018].

Takahashi does not explicitly teach that the coating liquid is dried. However, a spin coating method is performed immediately after coating the coating liquid. The rotation speed of 2500 rpm or more (pg. 35, lines 9-20) will cause some degree of drying.

Claim 7: A piezoelectric operation portion can include a plurality of electrodes and a plurality of piezoelectric layers which are alternately stacked on the ceramic substrate. [0019].

Claims 6,12: The coating liquid can be applied by a spin coat process at a rotation speed of 1500 rpm or more. The rotation of the substrate will cause at least some degree of vibration on the ceramic substrate or the piezoelectric layer.

7. Claims 1, 6, 7, and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by Takahashi et al. (2003/0234595, references are made to the provisional application No. 60/394,386).

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

The provisional application No. 60/394,386 has been reviewed.

Takahashi '595 teaches substantially the same piezoelectric structure as Takahashi '947 discussed immediately above. Takahashi '595 teaches that the coupling member comprises of an organic/inorganic hybrid mixture, wherein the organic compound can be an organic silicon having a general formula of  $R_nSi(OR')_{4-n}$  [0049]. Although the organic silicon compounds are not explicitly taught to be polymerizable, such organic silicon compounds can include species of polymerizable compounds.

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1762

9. Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahara et al. (U.S. Patent 5,856,837) in view of Takeuchi et al. (U.S. Publication 2002/0051942) and Takeuchi et al. (U.S. Patent 6,088,893).

Kitahara discloses a method of forming a piezoelectric film device, comprising:  
a lower electrode 20, a piezoelectric layer 1, and an upper electrode over a ceramic substrate 3;

forming the piezoelectric layer so that the ends of the piezoelectric layer project beyond the ends of at least one of the electrodes;

coating an insulating liquid to permeate through a gap between the projecting portion of the piezoelectric layer and the substrate, and coating discrete portions of said at least one electrode (Fig. 9).

Kitahara does not explicitly teach that the insulating material is a polymerizable oligomer. In fact, Kitahara does not limit the insulating material to any particular material. Takeuchi '942 teaches that certain resins (i.e., insulating materials) can undergo polymerization [0028]. The selection of something based on its known suitability for its intended use has been held to support a prima facie case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have used the polymerizable resins of Takeuchi '942 as the particular insulating material of Kitahara with a reasonable expectation of success because Takeuchi '942 teaches that such resin materials were well-known insulating materials.

Kitahara does not explicitly teach that the coating liquid includes an inorganic material. Kitahara does teach the desire to make the effective operation regions of the piezoelectric vibrating elements uniform (col. 2, lines 33-40).

Takeuchi '893 teaches that magnesia can be formed between the projecting piezoelectric portion and the substrate and that such a layer would improve the uniformity of the resonance frequency (col. 3, lines 22-65; col. 12, lines 42-47). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have deposited magnesia in the form of a coating liquid comprising the insulating material of Kitahara with a reasonable expectation of success. One would have been motivated to do so in order to have improved the uniformity of the vibrating piezoelectric element. In addition, both the insulating material and the magnesia

Art Unit: 1762

are to be deposited in the same position and for the same purpose. Thus, combining the two deposition materials into a single coating liquid to be deposited together would have been an obvious modification.

Claim 7: Kitahara, Takeuchi '942, and Takeuchi '893 do not explicitly teach a multilayered structure including a plurality of piezoelectric layers and electrodes alternately stacked. However, Takeuchi '893 does teach that the piezoelectric layer is used for electromechanical conversion having low driving voltage and quick response speed while providing a large generated force. Thus, it would have been obvious to one of ordinary skill in the art at the time of invention to have made a multilayered structure in order to have controlled such voltage, response speed, and generated force.

#### ***Allowable Subject Matter***

10. Claims 2-3 and 8-9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. Claims 4-5 and 10-11 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

12. The following is a statement of reasons for the indication of allowable subject matter: The prior art does not reasonably teach the deposition of a coating liquid between the projecting portion of the piezoelectric layer and the substrate via a coating apparatus comprising of a piezoelectric element portion disposed in a position opposing the pressurizing chamber on the discharge head substrate.

#### ***Response to Arguments***

13. Applicant's arguments filed 10/5/2006 have been fully considered but they are not persuasive.

Claims 1, 6-7, and 11 as anticipated by Takahashi '947:

The Applicant argues that Takahashi does not teach applying the coating liquid to discrete application portions. However, Takahashi teaches that the coating liquid is applied to at

Art Unit: 1762

least two different positions (i.e., on both sides of electrode 77) between the projecting portion and the substrate (Figs. 1-12). These two different positions are discrete portions because they are separate and distinct from each other.

### *Conclusion*

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Takeuchi et al. (5,376,857) discloses a piezoelectric layer 5 projecting beyond a lower electrode 4. An incompletely bonded region 8 is formed between the piezoelectric layer and the substrate. The incompletely bonded region can be formed by initially providing the substrate with dummy layers and subsequently forming the piezoelectric layer. The dummy layers preferably comprise a resin that can be burned out and partly or completely extinguished during the heat treatment of the piezoelectric layer (column 4 line 56 – column 5 line 8).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jimmy Lin whose telephone number is 571-272-8902. The examiner can normally be reached on Monday thru Friday 8AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JL  
JL

  
**KEITH HENDRICKS**  
**PRIMARY EXAMINER**